will further our understanding of the role fungal endophytes play in the success and/or failure of invasive plant species in natural areas.

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Biodiversity assessment: Farm Kyffhäuser, Namibia

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Namibian relatives of southern African plant taxa are often neglected or omitted from taxonomic and systematic studies, in part due to limited knowledge available for Namibian taxa, and in part due to problems concerning the logistics of collecting and correctly identifying Namibian plants. Here we introduce a new initiative to document, identify and make botanical data available from the farm Kyffhäuser, located just south of the species-rich Naukluft Mountains in Namibia. We present an overview of the habitat diversity (including rainfall patterns, river drainage systems, elevation and topography) of the region, followed by an up to date list of all plant taxa collected and identified to date. We evaluate this botanical diversity by listing rare and or endangered taxa discovered, along with numerous taxa found to present range extensions into this region. We consider weeds and invasives common to this area, and highlight some interesting plants recorded from the farm. Finally we introduce the website that has been established for Kyffhauser, and invite future collaborations.

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Grassland ecology along an urban–rural gradient using GIS techniques in Klerksdorp, South Africa

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Urban areas represent complex assemblages of unique vegetation communities. The multitude of influences on cities adds to this complexity and understanding the underlying patterns and processes operating in urban areas becomes increasingly important with large scale urbanisation. The urban–rural gradient approach often used to study these patterns and processes, aims to quantify the existing gradient allowing comparisons of vegetation at different locations, each with diverse human influences. However, accurately quantifying the urban areas became difficult with the realisation that gradients are non-linear and complex. Previous studies were not truly comparative due to differences in measures used to quantify the gradient and a lack of a well-defined definition for urban areas. Our study in Klerksdorp (North-West Province, SA) focused on testing a model developed in Melbourne (Australia) in an attempt to contribute towards creating a standard set of measures to quantify the urban–rural gradient. The methods used in Melbourne aimed to set a general standard with which to globally compare urbanised areas taking into account the entire extent of the study area allowing multidimensional insights into the unknown gradients. In our study, satellite imagery and GIS techniques were used to calculate measures representing demographic and physical variables, as well as landscape metrics. PCA and subsequent factor analysis of the 12 chosen measures showed the observed variation explained by both landscape and demographic measures. One measure per group was chosen to further represent the gradient. In addition, potential changes in grassland ecology were identified with vegetation surveys studying both the extant vegetation and the soil seed bank. Results indicated clear differences in the vegetation composition of comparable grassland patches at different locations along the gradient. This shows that urbanisation does influence vegetation composition and survival. Patterns and processes emerging from these studies could drastically influence planning and implementation actions concerning human development.

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On the evolution of leaflessness and morphometric studies of the *Psoralea aphylla* complex (Fabaceae)

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Leaf morphology within the genus *Psoralea* is highly variable, ranging from a complete absence of leaves, to a reduction of leaves into scales, to simple broad leaves or tiny filliform leaves, up to compound leaves made up of 3 to 11 leaflets. The leafless members of this genus form a species complex variously included in *Psoralea aphylla* (here referred to as the "*aphylla group*"). All *Psoralea* are leafy at seedling stage and the aphylla group has secondary reduction or complete loss of leaves. Whether this complex represents a single polymorphic species or multiple taxa that need to be recognised as distinct entities is not clear. In this paper, the taxonomy of the aphylla group is revisited to test the hypothesis that the loss of leaves is a single evolutionary event and hence members of the aphylla group represent a monophyletic entity. A phylogeny of *Psoralea* based on nuclear and chloroplast DNA sequence data is presented. Ancestral trait reconstruction for the presence or absence of leaves is performed on the phylogeny using maximum likelihood. Taxon delimitation is inferred from a

morphometric analysis of several morphological and floral characters. A key to the various taxa in the aphylla group is proposed.

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The evolution of sexual deception in *Gorteria diffusa*

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Thirty two angiosperm families are known to include species which achieve pollination by deceiving insects, but the vast majority of deceptive species are orchids (ca. 6500 of 7500 species). A surprising number of deceptive orchids exploit the sexual response of male insects to the mating signals released by females. Sexual mimicry is not known outside of the Orchidaceae. Pollination by deception might increase the fitness of plants through two main channels: 1) reallocation of resources destined for pollinator rewards (nectar, pollen etc.) into seed and fruit production or 2) increased outcrossing rates and efficiency of pollen export because pollinators visit fewer flowers on non-rewarding individuals than on rewarding individuals. In the case of sexually deceptive species the relevant question is why exploitation of male insects holds fitness benefits. In this talk I demonstrate pollination by sexual deception in *Gorteria diffusa*, the first report of this outside of the Orchidaceae, and then explore the selective pressures which may have lead to its evolution. I focus on the influence of differences in behaviour of male and female pollinators on outcross pollen transfer in this species.

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Can *Combretum erythrophyllum* leaf extracts be used to control cholera in water sources?

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When five antibacterial flavonoids were isolated from *Combretum erythrophyllum* leaves by bioactivity guided fractionation (Martini et al., 2004) and the activity against different bacteria was tested all compounds had very good activity against *Vibrio cholera* (MIC 20–40 μg/ml) the pathogen causing cholera in sewage infected water. With the pollution taking place in water bodies in southern Africa and the epidemic of cholera in Zimbabwe the possibility that crude leaf extracts could be used to disinfect polluted water was examined especially because *C. erythrophyllum* occurs all over southern Africa close to rivers and streams. Dry powdered leaves were extracted with acetone, methanol, hot water and different concentrations of soap and Tween 80. The activity of the crude extracts had excellent activity against two antigenic types (Inaba and Ogawa) of *Vibrio cholera* with MICs of 40–160 μg/ml. The best results were obtained with 1% soap and hot water extracts. The quantity obtained from 1 g of extract could be diluted to a volume of 4–10 l of water and still kill the bacteria. It appears that leaf extracts of dried *C. erythrophyllum* leaves obtained with solvents available to rural inhabitants may be useful to disinfect water polluted by *Vibrio cholera* if the laboratory data are applicable to the situation in the field.

Reference

Martini, N.D., Katerere, D.R., Eloff, J.N., 2004. Biological activity of five antibacterial flavonoids isolated from *Combretum erythrophyllum* (Combretaceae). Journal of Ethnopharmacology 93, 207–212.

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Effect of culture medium consistency and photoperiod on the micropropagation of *Theobroma cacao* L. axillary bud meristems

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The seeds of *Theobroma cacao* L. exhibit recalcitrant behaviour and can therefore not be stored in conventional seed banks. At present, cryopreservation is considered the most reliable, efficient and cost-effective means of storing the genetic resources of recalcitrant-seeded species for prolonged periods. However, the first step in cryopreservation is to determine an optimal *in vitro* micropropagation protocol for the explant of choice, in this instance *T. cacao* axillary bud meristems. The present contribution reports on the applicability of particular culture media for the growth of axillary bud meristems. In addition, the effects of semi-solid and liquid media, with cultures maintained under both light and dark conditions, were compared. The results of this study revealed that a culture medium composed of 6.6 g L^{-1} Murashige and Skoog salts; 0.05 mg L^{-1} BAP; 0.05 mg L^{-1} GA; 0.01 mg L^{-1} IBA and 30 g L^{-1} sucrose can be used for the production of shoots from *T. cacao* axillary bud meristems. Furthermore, it has been shown that culturing on semi-solid medium and incubation under a 16 h photoperiod was the most beneficial for shoot initiation while liquid medium, under the same light conditions, promoted shoot elongation. However, further research needs to be conducted to determine optimal root induction protocols for these explants, after which investigations can be undertaken to develop a